NOAA National Severe Storms Laboratory

Warn-on-Forecast

NOAA's Warn-on-Forecast research project aims to create weather computer-models that accurately predict storm-scale phenomena such as tornadoes, large hail, and extreme localized rainfall. If Warn-on-Forecast is successful, forecasters will have reliable guidance for issuing tornado, severe thunderstorm, and flash flood warnings up to an hour before they strike.

Warn on detection (The present)

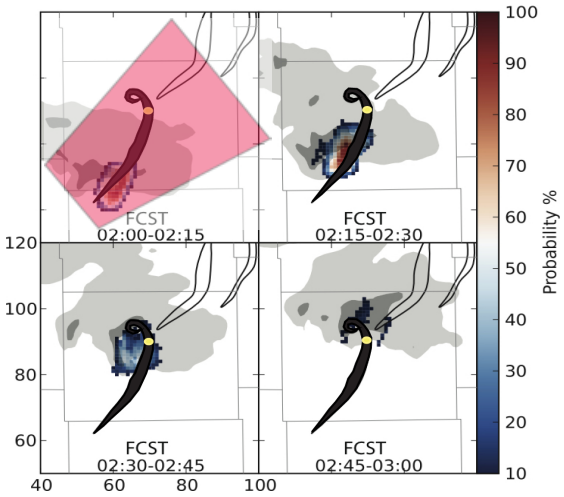
Right now, the NOAA National Weather Service (NWS) cannot issue warnings for severe weather until they see an early signal on radar, or the weather hazard is spotted. This approach provides the public with an average of 14 minutes advance notice before a tornado strikes. For some needs, this is not enough lead-time to move people to safety.

Warn-on-Forecast (The future)

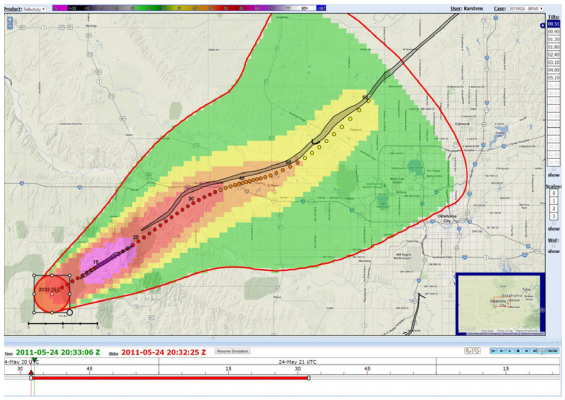
Warn-on-Forecast (WoF) researchers work to create the ideal combination of computer models that will predict specific weather hazards 30-60 minutes before they form. This advanced modeling system will predict probabilities of a hazard occurring, the confidence in the path, and adjust to trends in the threat level based on new weather observations, and rapid and adaptive radar scanning capabilities. Researchers are now working with a prototype system that uses rapid-scanning Multi-function Phased Array Radar to predict the path of a potentially tornadic supercell.

Warn-on-Forecast and FACETs

Warn-on-Forecast is the foundation of the new Forecasting a Continuum of Environmental Threats (FACETs), a proposed next-generation severe weather forecasting concept. FACETs aims to build a modern, flexible system that forecasters can use to communicate user-specific, understandable weather threat information. FACETs will serve as a "delivery mechanism" for WoF predictions of storm-specific hazards such as tornadoes, large hail, and extreme local rainfall. This work could advance the current NWS warnings from broad polygons, to grid-based probabilities of the hazard making an impact at a specific location. Decision-makers could set their own hazardous weather threat thresholds based on their specific needs.



Greensburg, Kan., May 5, 2007 test case: Probability of strong low-level rotation over 15-minute forecast intervals derived from a Warn-on-Forecast system. Tornado shown by light black lines.



This prototype Probabilisitic Hazard Information tool used MPAR data from WoF guidance for 24 May 2011. The forecast uncertainty of the location of the tornado is highlighted in colors related to the risk. The black line outlines the actual path of the tornado.

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Testing the Warn-on-Forecast concept

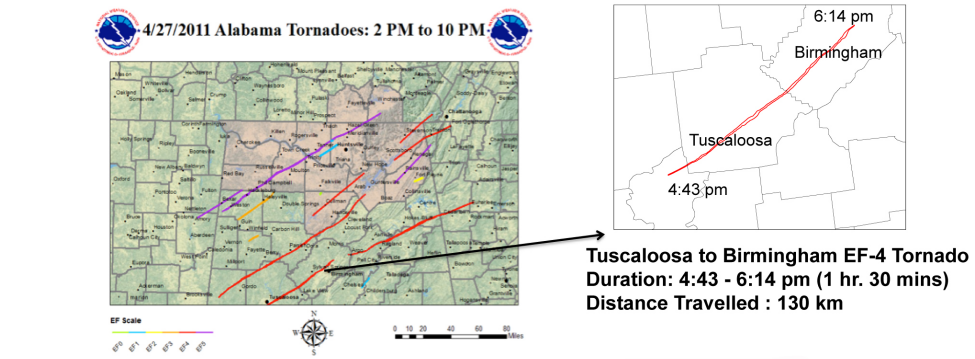
As new Warn-on-Forecast technologies emerge, they are tested in simulated forecasting and warning exercises in the NOAA Hazardous Weather Testbed (HWT), ensuring an efficient transition into forecasting operations. In the HWT, Warn-on-Forecast scientists and NWS forecasters have already evaluated multiple building blocks of a future Warn-on-Forecast system, including: 1) Phased Array Radar and its ability to provide more frequent updates than current NWS radars, 2) different techniques to feed radar data into forecast models accurately and quickly, 3) different suites of forecast models that can be combined into a single system representing all possible outcomes for a given weather event, and 4) development of strategies that allow forecasters to rapidly interpret computer-model guidance and add value in generating prototype forecast products.

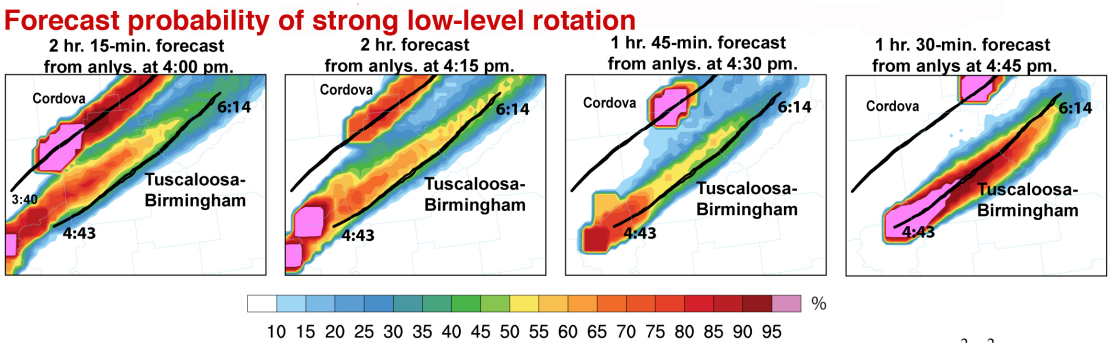
Forecasters and researchers evaluate prototype Warn-on-Forecast components in the Hazardous Weather Testbed

Supporting a Weather Ready Nation

Warn-on-Forecast activity supports requirements and activities documented in the NWS Weather Ready Nation roadmap, the NOAA 5-year Research and Development Plan, and recommendations in the National Academy of Science 2012 report, "The National Weather Service Modernization and Associated Restructuring."

Warn-on-Forecast is led by NSSL and represents a collaborative effort across several NOAA groups including the Earth System Research Laboratory, the Storm Prediction Center, and the Norman NWS Forecast Office. Academic collaborators are the Center for Analysis and Prediction of Storms, and the Cooperative Institute for Mesoscale Meteorological Studies at the University of Oklahoma.





An advanced WoF model processes the latest radar observations to predict the probability of rotation at 3,200ft above the ground in individual storms every 15 minutes. The black lines show the NWS observed tornado damage tracks. This case was from the April 27, 2011 tornado outbreak in the southeast U.S., focusing on northern Alabama.